

AN
ACCOUNT
OF THE
TOPICAL APPLICATION
OF THE
SPUNG E,



In the Stoppage of HÆMORRHAGES.

Read before the ROYAL SOCIETY,
February 11, and 18, 1762.

By CHARLES WHITE, F.R.S.
One of the Corporation of Surgeons in London, and
Surgeon to the Manchester Infirmary.

L O N D O N :

Printed for W. JOHNSTON, in Ludgate-Street.
MDCCLXII.

ACCOUNT

Thomas Swannick M. B.

ST. P. U. N. C. E.

In the presence of HARMON HAGBERG

and before the ROYAL SOCIETY
February 11, 1852

BY CHARLES WHITE, F.R.S.

One of the Secretaries of the Royal Society
London

LONDON

Printed for W. Johnston, Stationer

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Lon
Feb. 2

TO

DAVID MIDDLETON, Esq;

(Serjeant-Surgeon to his MAJESTY, Surgeon-General
to the Army, and Surgeon to St. George's Hospital)

Master to the Court of Examiners,

AND TO

The Rest of the Incorporated Society of
Surgeons in London.

GENTLEMEN,

AS I have the honour to be one of your
Company, I do not know to whom I
can so properly address the following sheets:
Give me leave, therefore, to put them under
your protection; and believe me to be, with
all due respect,

Your most obedient

humble servant,

London,
Feb. 22, 1762.

C. WHITE.

T O

DAVID MIDDLETON, Esq;

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1752.

AN
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S P U N G E, &c.

THE stoppage of such hæmorrhages as have been occasioned by the principal operations of Surgery, has in all ages employed the attention of those who have been concerned in the various branches of medicine. Fungous substances were certainly used by the ancients; but they laboured under these disadvantages, the circulation of the blood was then unknown, and the use of the tourniquet undiscovered. They had recourse to the actual and potential cautery, and some of them in amputations divided

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the * flesh with a red hot knife, in order to suppress, or rather to prevent the effusion of blood.

Styptics, and astringents of all kinds, were also applied ; but the insufficiency of these applications, added to the cruelty of some of them, and the bad state in which the stumps were frequently left by loss of substance, made all other methods give way to the ligature, either with, or without the needle. We are indebted to Ambrose Parey for this discovery.—At first he thought himself divinely inspired, and freely communicated his invention ; but, being virulently attacked by his cotemporaries, he attempted to prove in his defence, that his method had been in practice amongst the ancients, and in vain endeavoured to take away from himself the reputation to which he was so justly intitled. His improvement was however established, and for more than half a century was looked upon, in every part of Europe where Surgery was cultivated, as the most successful way to stop the

* Vesalius Chirurg. Magn. lib. v. Cap. 12. page 1082.

eruption

eruption of blood in divisions of the larger arteries.

This method has indeed since his time received some few alterations, particularly that of substituting the crooked needle for a straight one. For tho' Parey used a crooked needle in the sewing of deep wounds, yet he always made use of a straight one in applying the ligature to the vessels, in such cases as rendered the arterial forceps ineffectual.

Great inconveniences have notwithstanding attended this method: in amputation it is allowed, from the testimony of many who have undergone the operation, to be the most painful part of it, and “* it sometimes happens in a large stump, that ten or more vessels require tying.” Convulsive symptoms, the locked jaw, and even death † itself, have been its followers. It has also frequently been found insufficient, either when the parts have been lacerated and contused, or when the extremities of the vessels have been situated beyond the reach

* Sharp's Surgery, p. 218. Ed. 8.

† Warner's cases in Surgery, Ed. 3. p. 350.

of the needle; or again, when a fresh effusion of blood has happened many days after the operation, a plentiful suppuration having come on, and the parts being reduced to such a situation as not to bear a repetition of the needle. A case of this last nature happened to the Marquis of Rothelin * after the amputation of his thigh, and gave rise to a very ingenious contrivance of M. Petit. His instrument, which was fixed upon the end of the stumps, made a constant compression upon the vessel, saved the Marquis's life, and gained the greatest honour to the inventor.

There have been also machines invented by M. Sottere † and M. Belloque, for the stoppage of blood by compression, after the divisions of the intercostal arteries; and by M. Foucou ‡ for the suppression of violent hæmorrhages, occasioned by extractions of the teeth.

Pyramidal compresses have been frequently used with success, and are certainly

* Mem. Acad de Sciences, l'an 1731. p. 123.

† Mem. de l'Académie Royal de Chirurgie, tom. ii.

‡ lb. tom. iii, p. 27.

sufficient to answer their designs in wounds of the head and many other places, where the tightness of the bandage is not liable to do an injury to the neighbouring parts. But though perhaps there are not many arteries in which a stoppage may not be effected by compression when applied with a due degree of care and judgment, and that too without the inconveniences which attend the other methods; yet the nicety which is required to determine the exact degree; the danger * of making too tight the circular bandage in amputations; the length of time often required for the continuance of the compression, the difficulty of getting at the wound without tightening the tourniquet upon every dressing, and the hazard to which the patient is exposed from the possibility of the compresses being removed by any trivial accident, are such objections as have hitherto prevented this practice from coming into general use.

The disadvantages attending these several modes of operation, made it the general

* Medical Essays, Edin. vol. iv. Art. 22. p. 270.

wish,

wish, that some more easy, safe and certain method might be discovered; when the hopes of the public were raised by M. Brossard, who received a very considerable reward from his most Christian Majesty for his introduction of the agaric of the oak into practice. The most sanguine wishes seemed now to be gratified, and the discovery was embraced by most Surgeons with the greatest avidity.

However, mature experience and repeated observations have convinced us, that agaric is in many cases insufficient; and that some times where it seemed to have been successful, that success was as much to be attributed to the compression used, as to the virtues of the plant itself. Besides, on account of the little security of retaining it upon the mouths of the divided vessels, it was very disagreeable to practitioners to depend upon it, without its being watched with the greatest care and assiduity. Another difficulty too arose, which was that of procuring at all times the proper agaric; for as Mr. Warner * has justly remarked, the

* Cases in Surgery, p. 356.

oak produces two different kinds. The one has the appearance of soft leather, with a pile upon it something like that of velvet: the other is thick, rough, and hard; and there is yet another fungous substance frequently imported, and used for the agaric, which appears to be the same with that described by Bregnius under the title of *fungus coriacius quercinus Hæmatodes*. I have used all these, if I am not greatly mistaken, and in my opinion the last mentioned substance is much to be preferred to the agaric itself.

The lycoperdon and fungus vinosus have been also applied; but all these applications are now discarded in divisions of the larger arteries, and Surgeons find themselves again obliged to have recourse to the needle and ligature, notwithstanding its inconveniences.

There is however another remedy, which I think a duty incumbent upon me to lay before the public; one which as, far as I have observed, is not liable to any of the objections above recited, which is perfectly safe and easy in its application, and in its effects more certain than even the ligature itself.

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This remedy is nothing more than the inside of fresh and thoroughly dried sponge.

I would not here be understood to mean, that I arrogate to myself the merit of being the first, by whom sponge has been applied in the stoppage of hæmorrhages. I am sensible that I am not. Sponge was in use amongst the ancients, and they seldom if ever applied it medicinally upon any other occasions. We are told by Dioscorides, that new sponge conglutinates wounds and fistulous ulcers, and stops the effusion of blood. The ashes of burnt sponge were also used externally.

Galen recommends them as powerful restringents, and tells us, that one of his masters often applied, and always carried sponge about him, which as occasion served he burnt with pitch, and frequently used hot as a cautery or caustic to stop hæmorrhages after his operations in surgery.

Amongst the moderns, Dale*, in his Pharmacologia, says, that sponges are seldom if ever used internally, but frequently by Surgeons to stop bleedings.

Miller*, in his Bot. Offic. tells us, that they are used by Surgeons in embrocations, and to stop bleedings; and I must not omit what Mr. Reid of Chelsea has reported to the Royal Society, that Mr. Cheselden, after an operation for the stone in the year 1741-2, put into the wound, which bled too freely, a thin piece of wet sponge for it to bleed through, and that, contrary to his expectations, it prevented a further loss of blood. To these let me add, that Mr. † Morand slightly

* Page 424.

† “ At the close of the year 1751, an experiment
 “ was made on dogs with the agaric of oak, which had
 “ already served for the same purpose, after having wash-
 “ ed and dried it afresh, also with the agaric of beech, of
 “ birch, of the powder of lycoperdon, sustained by some
 “ pieces of its spongy part, with these same pieces alone,
 “ with the common touchwood, with little pieces of
 “ simple sponge very fine. The result of all these trials
 “ was, that the agaric of oak which had already been used,
 “ did not succeed so well as the fresh agaric; that the other
 “ agaries, the powder as well as the spongy part of the
 “ lycoperdon and the common touchwood, had all pretty
 “ nearly the same effect; though these different prepara-
 “ tions not being secured by compression, all failed; that
 “ the common sponge appeared at first to produce the
 “ same effect, but fell off with the rest. The detail of
 “ these experiments is to be found in a periodical work

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“ printed

slightly mentions some experiments made with sponges and other fungous substances upon dogs. I cannot however any where discover, that sponge alone was ever used after the divisions of the larger arteries in the manner I do.

Boerhaave enumerates seventeen sorts of sponges: The sponge which I use is close, compact, and slightly porous; it generally goes by the name of the male or fine sponge. If I am not mistaken, he has distinguished it in his Ind. Att. Plant.* by the title of *spongia, ad usum præstantissima, foraminibus exiguis pervia*, Tourn. 575. The best come from the Archipelago.

The sponge requires no other preparation than that of its being carefully dried. This for large arteries is absolutely necessary, especially in damp weather, scarce any substance imbibing a greater quantity of

“ printed at Paris, and entitled Journal Economique. See “ the months of April and June 1752.” But the author is not there named. Mem. of the Royal academy of Surg. Eng. Ed. by Neale, vol. ii. p. 186.

* Page 8.

moisture from the air; as is evident † when it is applied to the purpose of an hygrometer. Care ought however to be taken, that it be placed at so great a distance from the fire, when it is set to dry, as to prevent its crisping: and it ought afterwards to be kept in as dry a place as possible. I have used the outside of undried sponges upon small arteries with success; in these cases it may do full as well, as it may be taken off the wound more easily: but then it is necessary to observe, that, in proportion as you lessen its adhesive quality, you diminish its power upon the vessels. It is this property, which gives it so much merit: from hence arises its superiority to the agraic. It is the texture of its parts, and not any styptic or astringent virtue, from whence it derives its value.

† “ A pound of sponge, when weighed in a humid season, on drying carefully in a stove without injuring its texture, will be reduced to eleven ounces.” Cham. Suppl. art. Sponge.

I bought thirty-two sponges, which to all appearance were perfectly dry. When they were brought home they weighed eight ounces, but upon their being laid a few hours before the fire, they were reduced to the weight of six ounces.

The part which nature takes in the stoppage of blood, has been imagined by M. Petit and his followers, to be by a coagulum or clot of blood formed in the extremity of the artery, extending itself four, five or six inches up it, in the resemblance of a cone, with its base towards the part where the divisions was made. Petit has * delineated the figure of one of these little clots, from an artery which he opened after death ; but it is most probable that the coagulum was only formed at that time, his hypotheses being liable to many objections†. M. Pouteau has offered a much more probable conjecture; his opinion is, that the swelling of the cellular membrane, which surrounds the artery, brings the sides of the vessel into contact, and by that means prevents the blood from escaping. He opened several arteries in which no coagula were found, and where they were discovered, they appeared only to have been formed like polypusses at, or after death.

* Mem. Acad. de Sciences l'an. 1731.

† Melanges de Chirurgie, a Lyon 1760, p. 314.

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This swelling of the cellular membrane is also mentioned by Dr. Monro * in his Remarks on Amputations.

C A S E : I.

An Account of the good Effects of the Sponge, where the Needle and Ligature could not be made use off, and other Applications were found ineffectual.

MR. Ashton, of Castleton in Derbyshire, a strong healthful man, about thirty years of age, came over to Manchester, to consult me about a scirrhus tumor, that had been for some years growing under the maxilla inferior upon the right side, and in which he had lately perceived some darting pains, which, together with the increase of the tumor, had somewhat alarmed him. I advised him to have it dissected out ; he consented

* " For as soon (says he) as the ligature is made, the cellular substance beyond the stitch, having still a communication with the surrounding cells, swells and turns harder and firmer, so as to prevent the thread from sliding."

to the operation, and I performed it, in the beginning of October 1760, in the presence of two young gentlemen my pupils. After cutting through the integuments, I drew out the tumor with my dissecting hook, and extirpated it.

In performing this, there was a very considerable branch of the external carotid artery opened. It was situated so far under the maxilla in the bottom of the cavity, where the tumor had lain, that I found it impossible to turn the crooked needle in the wound. I enlarged the incision with my knife, and made a second attempt to take up the vessel with no better success. I ineffectually applied lint dipped in flower, several kind of styptics, agaric of the oak, and strong compression. But I must remark, that it was that kind of agaric which is thick, rough and hard, my stock of the other being quite exhausted. None of these applications succeeding, I was put upon the discovery of a proper substitute for the soft agaric; and dry sponge, appearing to me to have the greatest resemblance, I stuffed the wound quite full of it. I held it fast
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for a few minutes with my fingers; after some time the dressings were laid on, and a compress was applied with a tightish bandage. Not one drop of blood issued out from the wound after the application of the sponge: on the fourth, and every succeeding day, I renewed the dressing, letting the sponge remain, as I found it would not come off without some little violence, till the 10th, when I removed it, and at the same time made an observation, which explained to me the manner of its acting in the stoppage of blood. I observed that it adhered intimately to the cellular membrane, and fleshy fibres, with which it was so much interwoven, as almost to have the appearance of one body. This rendered it impossible that the least drop of blood should escape; and the reason of it appeared evident. The sponge being perfectly dry when applied to the wound, and kept on by a moderately tight bandage, introduces itself by its softness and elasticity between the fibres of the flesh and cellular membrane, which are themselves insinuated into the porous parts of the sponge. The sponge
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thus receiving and being received, is expanded by the moisture of the part, whence it becomes wedged so fast, as not to be torn away without force. The cohesion every moment grows more strong, till the sponge is fully expanded, and causes such a compression upon the sides of the vessel, as to bring them into contact, and render the escape of the blood impossible. If the torrent of blood therefore can but be restrained till these effects are produced, either by pressure upon the sponge, or by the use of the tourniquet, where that can be properly applied, there will be no danger of an hæmorrhage even after the divisions of the largest arteries; and should the bandage and dressings by any accident be displaced, the sponge will in a little time be found to have secured its own situation. I must here observe, that though the wound was quite filled with sponge, and though it remained ten days in that situation, I never saw one in a better condition than this was in at the expiration of that time. It was as thoroughly digested as if the most powerful digestives had been made use of.

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The sponge was fully saturated with the matter. The wound, though a deep one, in about a month was filled up with new flesh, and perfectly healed, by which I was satisfied that its cure was not in the least impeded by the application.

It was not long before I had repeated opportunities of observing the effects of the sponge in hæmorrhages proceeding from the smaller arteries, occasioned by the opening of abscesses, by accidental wounds in different parts of the body, by the extirpations of tumors of various sorts, and by the excision of scirrhuses and cancers in the breast. I likewise applied it to the lesser vessels after several amputations of the larger extremities, taking up however with the needle one or two of the principal arteries. For as the character of this remedy was not yet sufficiently established, I was careful how I proceeded, and therefore never ventured it alone, after the principal amputations, till the 10th of August 1761, when after taking off a leg it perfectly succeeded.

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CASE

C A S E III.

An Account of the successful Application of the Sponge, on the 20th Day after Amputation, in a Case where the Needle and Ligature had been made use of, and proved insufficient.

Thomas Taylor, of Billinge, near Wigan, in this county, aged 50, was admitted into the Manchester Infirmary on the 12th of January 1761, for some bad ulcers in his right-hand, which were attended with a caries of most of the carpal bones, and of the inferior extremities of the ulna and radius. These complaints had been of many years standing, and the absorption of the matter had brought on hectic heats, a bad cough, and nocturnal sweats. Under these pressing circumstances, it was thought necessary, at a consultation, to take off his hand in order to preserve his life. On the 15th of the same month, I performed the operation a little above its articulation with the radius and ulna.

ulna. After taking up the arteries with the needle and ligature, the stump was dressed with dry lint and flour, covered with pledgits spread with yellow basilicon, and secured upon the part by a proper bandage. Nothing remarkable happened till the 14th day, when a sudden and profuse hæmorrhage came on from the cubital artery, which was immediately taken up by a pupil in the house, but burst out again the next day, and was again secured by the needle and ligature. The day after that, upon another eruption, the agaric of the oak, Roman vitriol, and alum, were separately applied, strong compression was made use of, and the bark was given in great quantities. Not one of these had the desired effect. He still continued to bleed in a greater or less degree till the morning of the 20th day after the operation; when he had lost so much blood (notwithstanding the greatest care had been taken to restrain it, as often as it appeared, by the tourniquet, which from frequent use was obliged to be fixed in different places to prevent its galling) that what came from

him was so thin, as scarcely to retain either colour or consistence, and the linen he made use of, was, when dry, but just tinged here and there with red. In these deplorable circumstances I applied the sponge, and over it the usual dressing; but as all the parts contiguous were in a ragged rotten situation, as well from the frequent repetition of the needle, as from the bad condition of his body, I judged it necessary to make a stronger compression than usual on the part. I therefore applied a screw instrument, something similar to that which M. Petit contrived for the Marquis of Rothelin, to the end of the stump, over the dressing and bandage.

In the afternoon I was again sent for, and found him bleeding very fast: he had fainted away, and had so much the appearance of a corpse, that I thought he would have expired immediately. Upon uncovering the wound, I perceived that the instrument had been of great disservice, not having a sufficient surface to act upon. This was occasioned by the pointedness of the stump, which had been reduced by the repeated
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use of the needle and other applications. I was not however without hopes of success, if I could keep my patient alive a little longer. A fresh piece of dry sponge was placed over the mouth of the vessel, and upon that a quantity of lint to increase the surface. I retained these fast by four cross slips of good sticking plaister, and these again were secured by a roller. To make a compression upon the end of the stump, I fixed the screw instrument over all, with its straps brought up above the elbow, and there fastened as well as possible by a bandage, observing at the same time to keep the arm bent; and I continued for some minutes Freke's tourniquet tight upon the upper part of the humerus. A few hours afterwards I slackened the screw upon the end of the stump, the bleeding had entirely ceased, and never afterwards returned. At the end of three days I removed the dressings, and found that the sponge had so far secured itself in its situation, as not to be removed without considerable violence. Fearing a renewal of the hæmorrhage, I suffered it to remain between five and six weeks

weeks upon the wound : In which time granulations of flesh had shot up into the pores of the sponge ; and the difficulty of its removal was so great, that I was obliged to separate but a small portion of it every day, which I cut away with my scissars, till the whole was extirpated. The difficulty I here met with, has ever since obliged me to guard against this inconvenience, by removing the sponge after it has remained ten, twelve, or fourteen days upon the wound ; and if I have any apprehension of a new eruption, I apply fresh sponge, which I find much better than the continuance of the first application.

Perhaps it may be said, that the compression I made use of would alone have stopped the hæmorrhage.—Very possibly it might ; but then the compression must have been continued for several weeks, which by the assistance of the sponge was rendered totally unnecessary.

C A S E IV.

An Account of the Application of the Sponge with Success, after an accidental Wound in the Leg.

AS Orlando Hague, of Ashton Under-line, aged 48, was getting peat upon the 8th of June 1761, he had the misfortune to strike his turf-spade into the inside of his leg, about the middle of it, and open the artery called tibialis postica. A torrent of blood instantly succeeding, he had the presence of mind to tie his handkerchief very tight about his leg, which probably saved his life, as by that means he restrained the hæmorrhage a little, though he could not stop it entirely. His friends immediately brought him to Manchester, which is five or six miles from the place where he received the hurt, he continuing to bleed all the way.

I fixed the tourniquet above his knee; and, after I had sufficiently cleansed the wound from grumous blood, applied dry sponge,
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and over that the usual dressings, retained by a moderately tight roller. I then loosened the tourniquet; and though he was directly carried up to the Infirmary, which is a quarter of a mile distant from the house where I applied the sponge, not the least effusion of blood succeeded.

The sponge was removed in about a week after the accident; he remained in the Infirmary till the 22d of the same month, when, after being made an out-parient, he returned home, and on the 27th of July was discharged, perfectly cured.

C A S E V.

An Account of an Amputation of the Leg below the Knee, where the Sponge was applied with Success.

William Slater, of Knott Lanes, in the parish of Ashton, aged 24, of a very scrophulous habit of body, had for some years been troubled with white swellings in his ancle, which at last gathered and broke. The inferior extremities of the

the tibia and fibula, and some of the tarsal bones being carious: Upon the admission of the air, his pain increased greatly, and the absorption of the matter brought on hectic symptoms, a bad cough, and colliquative sweats. Amputation was the only chance to save his life, and I performed the operation on the 10th of August 1761, in the presence of one of my pupils, and of several other persons. After sawing through the bones, the tourniquet being slackened, the arteries tibialis antica, postica, and peronea, bled very freely. I again tightened the tourniquet, wiped the stump with a sponge pressed out of warm water, and cleansed it from grumous blood. Three pieces of dry sponge were now applied to the extremities of the vessels, over them the common dressings, and these were retained by a roller, put on no tighter than just to keep the sponge in contact with the ends of the arteries.—He was put to bed, and the tourniquet kept tight for fifteen minutes, after which I slackened it entirely, and had no further occasion to repeat its use. He was

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remarkably easy after the operation, much more so than I had ever observed any patient after the use of the needle and ligature. He slept well all night without the assistance of any opiate, and no symptomatic fever ensued. Upon the fourth day I removed the dressings, and found that the sponge adhered very closely. The wound was dressed every day, and at every dressing a little lint put under the sides of the sponges, to make them separate more easily. On the 10th day I removed one piece of sponge, and on the 12th the other two, entire, with the greatest facility, and without the least hæmorrhage ensuing. The stump looked remarkably well, was as thoroughly digested where the pieces of sponge had lain, as if the most powerful digestives had been applied, and continued to mend without interruption. However, his other symptoms grew daily worse, he was quite tired out with taking medicines, and evidently appeared to be in the last stage of a consumption. The stump being now almost entirely healed, my longer attendance became unnecessary. I therefore discontinued my
visits

visits about the latter end of October, and have been since informed that he is dead.

C A S E VI.

An Account of the Success of the Sponge after the lateral Operation for the Stone.

C. D. aged 69, having been troubled with the stone in his bladder for some years, came over to Manchester in August last, in order to be cut. I performed the operation on the 27th of the same month, in the presence of Dr. Nathan Alcock, Fellow of the Royal Society, and of the college of Physicians, of my father Dr. Thomas White, Licentiate of the college of Physicians in London, and member of the Royal Academy of Surgery at Paris, and of several other gentlemen, when a large stone was extracted. My patient struggled much; which, added to the heat of the weather, made him bleed very freely from an artery upon the prostate gland. I tried the effect of lint dipped in vitriol water; but that not succeeding, I introduced a piece of dry sponge,

to which I had tied a thread, in order to extract it whenever it should be found necessary. This stopped the bleeding. In about two hours the urine ran out of the wound, (through the sponge) perhaps with less difficulty than if no sponge had been made use of; for it sometimes happens, that the water does not make its exit so freely as could be wished. In a few days I began to separate the sponge from the sides of the wound with my fingers. Upon the 8th day I introduced an hollow cane, whose diameter was about two-thirds of an inch, and by the help of the thread drew the end of the sponge into it; then thrusting the cane gently forward with one hand, and drawing the thread with the other, I pulled it more and more till the whole was separated; not the least hæmorrhage ensued, and he returned home cured in about nine weeks after the operation.

CASE

C A S E VII.

*An Account of the successful Use of the
Spunge after an Amputation of the Hand.*

JAMES Berry, of Worsley, in this county, aged 20, a strong healthful man, of a sanguine constitution, had the misfortune to have his hand greatly shattered by the fall of a stone, as he was working at the canal belonging to his Grace the Duke of Bridgewater. The accident happened about nine o'clock in the morning of the 5th of September 1761, and he was brought to the Infirmary that day about noon. He complained of great pain, which extended itself up into his shoulder ; he was very hot, and his pulse full and quick. At a consultation, amputation was thought necessary, and I took off the hand at its articulation with the radius and ulna about two o'clock in the afternoon, in the presence of Mr. James Burchall and Mr. Edward Hall, Surgeons to the Infirmary, of Mr. Nathaniel Poole the Apothecary, and of several other gentlemen.

men. Upon my slackening the tourniquet, the radical and cubital arteries spouted out ; I tightened it again for about fifteen minutes whilst I applied the sponge, and usual dressings, and secured them by a roller, when it was entirely loosened without the least effusion of blood succeeding. The heat and pain in his arm still continuing, I ordered him about seven o'clock in the evening to lose sixteen ounces of blood, and to take an opiate ; which, together with nitre, and a little opening physic, in a few days removed these symptoms. One of the sponges was taken away without any difficulty upon the seventh, and the other upon the ninth day after the operation. The wound had a very good appearance, was thoroughly digested, and every thing went on extremely well till the 16th day, when he began to perceive a little soreness in his throat, a stiffness in his lower jaw, and a pain in his fore-arm. These complaints, which he attributed to a cold, were so very trifling, that he did not acquaint any person with them till the 19th after the accident, when it plainly appeared that he was affected

ted by that terrible symptom of a disorder called a locked jaw. As this symptom could not possibly be occasioned by the sponge, the particulars are foreign to my intention : it is sufficient to observe, that, after many medicines had been tried, particularly opiates in great quantities, both externally and internally, without the least sign of amendment, he was perfectly cured by frequent repetitions of warm bathing, which was agreed to at a consultation upon my proposal. I was induced to try this remedy by the good effects which I had formerly experienced from it at the close of a disorder of the same nature, an account of which the gentlemen of the Medical Society in London have done me the honour to publish, in the second volume of their Observations and Inquiries. In which case, however, the warm bath was only made use of, to remove that stiffness and universal rigidity which remained after the removal of the disorder ; but in this it was evident that the locked jaw, and other spasmodic and convulsive symptoms, were absolutely removed by the help of the bath alone. He was dis-

discharged on the 7th of December with a good stump, and without the least disagreeable symptom remaining.

C A S E VIII.

An Account of the successful Application of the Sponge, after an Amputation of the Fore-Arm.

ALice Horradge, of Harwood, aged 44, had been for some years troubled with ulcers in the fore-arm, attended with a caries of the carpal bones, and of the lower extremities of the radius and ulna. After having been unsuccessfully treated by several persons, she came into the Infirmary, in order to have her arm taken off; and I performed the operation in the middle of the fore-arm on the 2d of November 1761, in the presence of Dr. Peter Mainwaring, Dr. Samuel Kay, and of Dr. Philip Brown, Physicians to the Infirmary, of Dr. John Lloyd, F. R. S. and of several young gentlemen. Upon loosening the tourniquet, the radial and cubital arteries, together

gether with the smaller branches bled freely. I tightened it again, and dried the stump with a sponge pressed out of warm water. I applied pieces of fresh dry sponge to the extremities of the vessels, and over them the usual dressings, retained by a linen roller, some turns of which were brought above the elbow of the tightness usual after amputations. At the expiration of a quarter of an hour the tourniquet was slackened, without any effusion of blood. She was remarkably easy after the operation, and no symptomatic fever ensued. Upon the 8th day I removed the sponge which lay upon the cubital artery. This occasioned the vessel to bleed again, but with a very small contracted stream. I stopped this eruption with my thumb, till a fresh piece of sponge could be got ready, upon the application of which the hæmorrhage instantly ceased, without my being obliged to have any recourse to the tourniquet. Upon the 10th I took away the other sponge without any inconvenience, and I removed that which was last applied upon the 14th, without the least effusion of blood. The

wound was as fine and fresh as possible, it continued to mend without interruption, except in one small spot, where a piece of sponge about the bigness of a pin's head had been left; this I expected would have digested away of itself, but finding it would not, I touched it with spirit. vitriol. fort. which entirely took it away. She was discharged cured, January 25, 1762.

C A S E IX.

An Account of an Operation for the radical Cure of the Hydrocele, in which the Sponge was successfully applied.

RObert Fletcher, of Little Levir, in this county, aged 47, was admitted into the Manchester Infirmary, and fell under my care. He had on the right-side an hydrocele of the tunica vaginalis testis, and on the left not only an hydrocele of the same tunic, but also of the tunica vaginalis of the spermatic cord, which extended up above the rings of the abdominal muscles.

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The septum between the two hydroceles of the left-side was broke, and the unfortunate patient laboured under more pain on that side, than I ever knew to proceed from this disorder. I punctured both sides with my lancet, and let off the water; but in a few weeks they were filled again, and his pain returned. As he was prevented following his business, which was the only maintenance of his family, and was continually in torture, he was desirous of undergoing any thing that might free him from his disorder, and I consented to the operations on both sides, for the radical cure, on the 1st of December 1761. These I performed nearly after Mr. Douglas's method by the excision of the cysts, but without removing any of the skin, as he had not any to spare. He bore these painful operations with the greatest fortitude and patience. There was no hæmorrhage of consequence, except from the scrotal artery upon his right-side. To this I applied a piece of dry sponge, and held it on with my fingers about a minute, which perfectly stopped the bleeding; over the sponge I

placed the common dressings, and retained them on by a bag-truss. At these operations were present Dr. Kay, and several young gentlemen. My patient told me in the afternoon, that he had more ease than he had for some weeks felt. He rested pretty well at night, without the assistance of any opiate, and very little of a symptomatic fever ensued. On the 8th day I removed the sponge without any hæmorrhage. He continued to mend without interruption, and was discharged cured upon the 11th of January 1762.

C A S E X.

In which the Sponge was applied with Success below the Knee after Amputation.

JAMES Oats, aged 15, was admitted into the Infirmary, for ulcers in the ancle, attended with a caries: Amputation was resolved upon at a consultation, and I performed the operation upon the 1st of December 1761, about noon, in the presence of Mr. Poole the Apothecary, and of several

ral young gentlemen, apprentices or pupils to the Surgeons of the charity. After I had taken off the limb, I applied the sponge to the arteries, and kept the tourniquet tight for about fifteen minutes, when I loosened it without the ensual of any hæmorrhage. The patient was very restless and ungovernable, and about seven o'clock pulled up the stump, in which he had some twitchings, with such a jerk from the pillow as occasioned it to bleed. The tourniquet was immediately applied, and I was sent for by an assistant whom I had left in the room. The sponge which I had made use of was undried, just as it came out of the Apothecary's shop, neither was it of so good a sort as I could have wished, a great part of what was in the house having been wet and damaged in the carriage. For these reasons I thought it proper to apply some fresh sponge, which I had brought with me, and upon which I could have a greater dependance. The hæmorrhage was from the tibialis antica, and as the mouth of the vessel had receded, I was apprehensive that the interosseal ligament, along the side of
which

which the artery runs, might from its resistance prevent the sponge's coming properly into contact. I therefore cut into the ligament about one third of an inch with scissars, and after cleansing the stump from blood, and drying it with a sponge, I applied dry sponge, not only to the extremities of the vessels, but even covered the greatest part of the wound with it, in order to prevent any trouble from the small capillary vessels. I loosened the tourniquet in about a quarter of an hour, and gave my patient an opiate in order to keep him quiet. He did not bleed one drop after this, was perfectly easy, and slept well all night. He had no occasion for the repetition of the opiate, and had little or no symptomatic fever. I removed some of the sponges upon the 10th day after the operation, but did not take away the rest till the 14th, when they all came off entire, except one which lay upon the tibialis postica. This as I was attempting to remove it, tore, and part of it was left behind. The accident was owing to the sponge's not being cut transversely, as it ought to have been ;

been ; and as the other pieces were but according to the lay, which occasioned the last stratum of the sponge to be left behind, I should have found some difficulty in removing this stratum, if I had not hit upon an expedient which easily made it separate. This was by touching it with the butter of antimony, which, tho' a very strong caustic, occasioned little or no pain, as there was not so much used as would affect the stump so far as to make an eschar, but only just such a quantity as would effect my purpose. I am confident this accident will never happen, if the sponge be cut properly, and be not of a ragged rotten sort. But if, from any mistake, this should ever be the case again, I would advise the application of either of butter of antimony to the sponge, or of that strong spirit of vitriol, which is improperly called oil of vitriol. For if any part of the sponge should remain, it would be productive of nearly the same, tho' perhaps of not quite such bad consequences, as arise from the leaving a stitch behind. Granulations of the flesh would be apt to shoot up and cover it, as they

they sometimes do a stitch, and would probably retard the healing of the stump. I would not be understood to mean that I would touch the stump itself with any potent caustic. I would only apply it to the sponge. For if a liquid caustic be made use of, it will run through its pores, and thereby bring on a separation. My patient continued to mend without interruption, is now strong and healthy, and his stump nearly healed.

C A S E XI.

*Of an Amputation of the Breast, where the
Sponge was applied with Success.*

A. B. of Manchester, aged 60, consulted me upon account of a cancer of a very quick growth, in her right breast. Though she had not had any complaints for more than six or seven months, it had already begun to ulcerate, but was not adherent. I advised her to have the breast taken off, which she consented to, and I performed the operation upon the 5th of December 1761, about two o'clock in the after-

noon, in the presence of three young gentlemen my pupils. The wound bled more freely than ever I had seen one of the same nature, not only from a large artery, but from its whole surface, which was far from being small. I wiped it as dry as possible, after which I applied a piece of sponge to the mouth of the large vessel, and lint and flower to the rest of the wound; but it continued to bleed so fast, that I was obliged to remove the lint, and cover the whole with sponge: my sponge was just as it came out of the sadler's shop, and as it was a wet day, had imbibed so great a quantity of moisture from the air, that I was afraid it would not answer. Accordingly some blood did ouze through it. I therefore laid several pieces of sponge before the fire to dry, and as I was called away to another patient, left directions with Mr. Starkie, my apprentice, to remove the sponges which had already been applied, provided the wound should continue to bleed, and to apply those which I had laid to dry. This he accordingly did about half an hour after. The hæmorrhage instantly ceased, and never af-

terwards returned. From hence appears the necessity of having the sponges sufficiently dried, the same sponge when moist proving insufficient. Five or six pieces of sponge were applied. They not only covered the whole surface of the wound, but even part of some of them lay under its lips. Her breast was easy after the operation, and she had no symptomatic fever. By degrees I loosened the sponges, and removed them one by one, till the last was taken away upon the 14th day after the amputation; though the wound had been wholly covered, I never saw one in a better state, or more thoroughly digested, and it was perfectly healed in about six weeks after the operation.

This case gave me more than usual trouble; but I had before made successful use of the sponge, after the amputation of a lady's breast from Blackrod, upon the 27th of October 1768, without the occurrence of any vexatious accident.

CASE

C A S E XII.

An Account of an Amputation above the Knee, after which the Spunge was applied with Success to the Crural Artery.

ALice Watſon, of Manchester, aged 12, was admitted in the Infirmary, upon the 7th of December 1761. She had been received as a patient about ten months before, for a white ſwelling in her knee. I then adviſed her to have the limb taken off; but upon her refuſing to conſent, ſhe was removed by her friends. She was, however, now brought with a great deſire of ſubmitting to the operation, but was much altered for the worſe. The buſſal ligament was ſo conſumed, that there was a perfect diſlocation of the joint. Several ſinuouſ ulcers run up the thigh. The diſcharge was very great, hectic heats were daily conſuming her, and ſhe was ſo emaciated as to be reduced to the greateſt extremity. At a conſultation of the Phyſicians and Surgeons of the Infirmary, amputa-

tion was agreed upon, as her only, though but a wretched chance. I performed the operation in the middle of the thigh, upon the 16th of December 1761, in the presence of Dr. James Walker, late Physician to the Infirmary, and of several other gentlemen. Upon slackening the tourniquet the femoral artery bled freely. I tightened the tourniquet again, and after drying the stump with a sponge pressed out of warm water, I applied a cubical piece of sponge, whose diameter was about an inch, to the mouth of the vessel; and to prevent any collateral branches from being troublesome, I placed a whole undried sponge over the other, upon the surface of the stump, secured by four cross slips of good sticking plaisters. These I put on not only to keep the sponges in contact, but also to prevent the skin from receding too much. By degrees I slackened the tourniquet, and in less than half an hour after the sponges were applied, I entirely loosened it. Upon the 8th day I took off the cross slips of plaister and the upper sponge, and upon the 12th removed the sponge which lay upon the femoral

femoral artery. No hæmorrhage ensued, and the wound was perfectly digested. She is constantly attended by Dr. Brown, who prescribes such medicines as are most likely to recover her health, but, as the amputation was deferred by much too long, with very little prospect of success. It is now seven weeks since the operation was performed, the patient is alive, and the stump near healed.

C A S E XIII.

An Account of an Amputation of the Great Toe, and part of the Foot, where the Spunge was used with Success, without having Recourse to the Tourniquet.

MARY Shephard, of Rochdale, aged 20, an inn-patient of the Infirmary, was troubled with a spina ventosa of the inferior extremity of the first bone of the metatarsus. On the 16th of January 1762, I took off the great toe, together with the inferior extremity of the metatarsal bone to which it is joined. An artery bled freely. A piece of dry sponge was

applied, and over it the usual dressing, retained by a roller just tight enough to keep the sponge in contact with the vessel. This immediately stopped the hæmorrhage, notwithstanding the tourniquet was neither used during the time of, nor after the operation. The sponge was removed upon the 7th day without any hæmorrhage ensuing.

C A S E XIV.

An Account of an Amputation of the Leg below the Knee, after which the Sponge was applied with Success.

JAMES Percival, of Manchester, about 8 years of age, was brought to the Infirmary, in order to have his leg taken off, for a caries in the ankle joint. I performed the operation in the morning of the 26th of January 1762, in the usual place below the knee. Immediately after the amputation I cut upwards into the interosseous ligament about one third of an inch. I easily discovered the principal arteries without slackening the tourniquet, and applied pieces of dry

dry sponge to the mouths of the vessels, over them a small whole sponge undried, retained by four cross slips of good sticking plaster; upon these I placed pledgits of tow spread with yellow basilicon, and then secured the whole by the bandages commonly made use of in such cases, put on with the usual degree of tightness. I slackened the tourniquet in about eight or ten minutes after the application of the sponge, without any hæmorrhage ensuing. The patient did not lose a spoonful of blood. In about an hour he took a quarter of an ounce of the syrup of poppies, was perfectly easy, and slept most of the afternoon. Dr. Brown and several other gentlemen were present. As he was a little restless, about midnight he took another quarter of an ounce of the syrup of poppies. After this he rested perfectly well, was free from pain in the morning, and had scarcely any symptomatic fever.

On the 5th day I took off the cross slips of sticking plaster and the upper sponge. On the 8th I removed that sponge which lay upon the peroneal artery, and upon the

the 10th day after the operation I took away the other two whole and entire, without the least hæmorrhage ensuing.

The sponge has never yet failed me, though I have applied it within these sixteen months to upwards of fifty patients, and have constantly used it since last Midsummer, without ever having had recourse to the needle and ligature, except in two instances. In these cases I made use of the ligature, not because I thought the sponge was insufficient, but because I apprehended it would be more convenient. My patients were two persons afflicted with the stone, a boy from Wakefield, whom I cut in the Infirmary, upon the 7th of October 1761; the other a gentleman from Halifax, who underwent the operation about the middle of the same month. In both these cases an artery was opened at the beginning of the operation, and it appearing most prudential to secure the vessel before I introduced the gorger, I chose this method of doing it, as that which would be liable to the fewest inconveniences.

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From the observations which I have made, I am at present of opinion, that if the sponge be used according to the rules which I have laid down, and which I shall again recapitulate, it is preferable to any other method, and will always prove successful, except in some few capital cases, where the tourniquet cannot be made use of; as after the amputation of an arm at the scapula, an operation which so seldom occurs, as hardly to deserve the name of an exception, but in which, whenever it does, the needle and ligature will certainly deserve the preference, as well as in such cases in lithotomy as are similar to those above-mentioned; but on the arteries which lie upon the prostate gland the sponge will have the advantage, as those vessels cannot easily be come at by the needle:

I shall not be ashamed to retract any thing I have advanced, if I shall hereafter find that I have been too sanguine in my expectations. But I thought it better to publish the few cases which have already presented themselves, than to wait for more, as by this means other proficients will be

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more easily induced to make trial of the sponge, and, I firmly believe, to establish its reputation. It has already been successfully applied by several Surgeons in smaller cases upon my recommendation. But I have not yet heard that it has been entirely relied upon by any person, except myself, after amputations of the larger extremities, or in any of the capital operations. I have not applied any strong compressions to the ends of the stumps after any of the amputations, where the sponge has been made use of, except in the case of Thomas Taylor, upon whom, as the reader will remember, the needle and ligature proved ineffectual. It has not even been found necessary for an assistant to make any pressure, as is frequently practised with the palms of his hands. But if powerful compressions should hereafter appear expedient upon the stumps of patients of sanguine constitutions, no damage will ensue, provided the circular bandages are not too much tightened; and even in these cases the sponge will claim the preference over the needle and ligature. Whenever a strong compression is found

necessary

necessary after amputation, either above the knee or above the elbow, it will best be made by a screw-instrument, fixed to the end of the stump, and properly secured by bandages. In both these cases, these straps must be brought up over the shoulders; but after amputations, either below the elbow, or the knee, sufficient pressure may be made by the double-headed bandage, in the manner described by M. Pouteau, in his *Mélanges de Chirurgie*, p. 355.

These strong compressions will but seldom be found necessary where the tourniquet-ligature is made use of. If it should appear otherwise, it will not be requisite to continue them longer than a single night, as the sponge will by that time have secured itself so effectually, as not to stand in need of any assistance.

Dr. Stork * has affirmed that it is of pernicious, and often indeed of fatal consequence, to cover the whole wound with agaric. In regard to the sponge, the direct contrary is true. I have frequently covered

* *Libellus secundus*, p. 135.

the whole wound with it, and, if I am not too much prejudiced in its favour to judge impartially, have always found that a wound looks clearer and fresher after this, than after any other application.

The rules, of which I would recommend the observance, are the following.

To chuse such sponges as are close, compact, and not ragged. Either to keep them dry in some place near the fire, or to dry them moderately before the fire, but not to such a degree as to destroy their power of expansion. As sponges grow from roots *stratum super stratum*, they should not be cut horizontally, in such a manner as to separate the lays, but perpendicularly through the lays, so that every layer may be cut through.

Before the application of the dried sponge, the wound must be cleared from grumous blood, and wiped as clean as possible with a sponge prepared out of warm water.

If the divided artery be large, the inside of dry sponge, cut to the most convenient size,

size, must be applied ; and after amputations, or other wounds where the tourniquet can be made use of, that instrument should be kept tight during the time of cleansing the wound, of applying the sponge, and for ten, fifteen or twenty minutes afterwards. The tourniquet which I would recommend is the screw one, either that of Freke or Petit ; both of which, as they do not totally prevent the circulations being carried on in the small collateral branches, are preferable to the common tourniquet-ligature. I would also advise the placing of a bolster upon the principal artery, previous to the fixing of the tourniquet, as by that means the tourniquet will acquire a greater power upon the vessel with a smaller degree of tightness.

A gentle compression must be made upon the sponge, either with a linen roller, or with cross slips of good sticking plaister.

If the wound happens to be in a place where the tourniquet cannot advantageously be used, as was the case of the first patient upon whom I used the sponge, the sponge must be pressed tight into the wound,

wound, a compress of linen placed over it, and it must be secured by such a roller as will make a powerful pressure; observing at the same time to keep the patient very cool. Upon the smaller arteries it will be sufficient to use the outside of undried sponge, retained by a bandage of moderate tightness.

After amputations below the knee it will be proper to cut through the Interosseal ligament about one-third of an inch, for the reasons given in Case X.

If at any time after the application of the sponge, the wound should bleed again, but in no greater quantity than just to wet through the dressings and the roller, very little regard ought to be paid to it; even the tourniquet itself should not be tightened: For, in such a case, as the blood may be only venal, the tightening of the tourniquet would probably be the means to increase it. If the wound should bleed afresh, so much as to give reason to suspect that the blood proceeds from an artery, the tourniquet should be immediately tightened. I would not, however, advise a stronger compression

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on the sponge ; but as it may be supposed to be fully saturated with blood, and therefore unlikely to stop the hæmorrhage, I would apply a fresh piece, and retain it by such a degree of compression as the emergency may render necessary.

At every dressing small pieces of lint should be placed under the edges of the sponge, to facilitate its removal ; and when it is intended to be taken away, it should be done by taking hold of its end, and pulling it off, as you would a common sticking plaister.

The sponges should not be permitted to remain on longer than ten, twelve, or fourteen days at most, after their application.

If the smallest portion of any of them should adhere so closely to the wound as not to be removed by gentler methods, it ought immediately to be touched with some liquid caustic. This caustic, however, will be unnecessary where the sponge is cut according to the directions given above.

Manchester,
February 4, 1762.

E R R A T A.

Dedication, Line 5. *for* Master to the Court of Examiners,
read Master,

To the Court of Examiners,

- Page 4, Line 11. *for* Stumps *read* Stump
 16. *for* Sottiere *read* Lotteri
 7, 21. *for* I think a duty *read* I think it a duty
 10, 6. *for* do *read* practice
 12. *for* Alt. *read* Alt.
 16. *for* no *read* little,
 11, 8. *for* Spunges *read* Sponge
 17. *for* agraic *read* agaric
 12, 8. *for* divisions *read* division
 12. *for* Hypothyses *read* Hypothisis
 14, 17. *for* kind *read* kinds
 15, 8 & 9. *include* as I found it would not come off without some
 little violence *in a Parenthesis*
 18, 1. *for* CASE III *read* CASE II *for* Case IV *read* III and
 so on
 21, 19. *after* Stump, *instead of* a Comma *put* a Semicolon
 30, 2. *for* radical *read* radial
 25. *after* 19th *read* day
 34, 15. *for* Levir *read* Lever
 38, 4 & 5. *for* with Scissars *read* with my Scissars
 39, 1. *after* were *put* a Comma
 18. *for* either of butter *read* either butter
 43, 6. *for* in *read* into
 44, 18. *for* plaisters *read* plaister
 45, 22. *for* ineferior *read* inferior
 48, 14. *after* Stone *read* the one
 52, 22. *for* prepared *read* pressed
 54, 7. *after* of *read* a
 12. *for* X *read* IX